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Career-Focused Course Sequencing and Retention to Graduation in a Tennessee Community College

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by

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ABSTRACT

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The purpose of this study was to identify course sequencing associated with Industrial Technology Associate of Applied Science students who persisted to graduation at Northeast State Community College (NSCC) in Blountville, TN. The participants in this study were first-time full-time freshman Advanced Technology students whose 3-year program of study at NSCC happened during the years of 2009-2012, 2010-2013, and 2011-2014. Participants were divided into 2 groups, students who graduated (completers) and students who did not graduate (noncompleters). The researcher examined student persistence to graduation. Data for this study were obtained from the college's information database.

The predictive variables used included whether a required learning support reading course was taken during semester 1, whether a required learning support writing course was taken during semester 1, the percentage of technical courses taken during semester 1, the percentage of technical courses taken during semester 2, the percentage of general-education courses taken during semester 1, and the percentage of general-education courses taken during semester 2.

This study was conducted using quantitative methods to determine course sequencing and relationships among course scheduling characteristics that may affect student retention and persistence to graduation. Data were analyzed using Chi Square tests of independence (2-way contingency tables) to determine whether there was a significant association among variables. The study data were used to analyze the relationship between the ratios of courses taken in either career-focused or general-education courses during the first 2 semesters of attendance. The *hours taken* value in each category was divided by the *total hours attempted during the semester* value. The data were coded as nominal data into 5 categories, 0%-20%, 21%-40%, 41%-60%, 61%-80%, and 81%-100%.

A Chi Square test of independence was used for the analysis of all questions to determine significance. All questions were analyzed at the .05 level of significance. The analysis indicated that students requiring at least 1 learning support course experienced a negative effect and were less likely to graduate from the program in 3 years. The percent of career-focused courses taken during the second semester were significantly related to graduation in 3 years. There was a negative effect on graduation in 3 years for students who enrolled in 40% or less career-focused courses and a positive effect for students who enrolled in 60% or more career-focused courses during the second semester.

DEDICATION

This work is dedicated to my wife Janet for her unwavering support and belief in me throughout this journey and throughout our entire life together.

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CHAPTER 1

INTRODUCTION

The State of Tennessee passed the Complete College Tennessee Act (CCTA) in January 2010. The primary focus of the CCTA is to provide a resource for the state's economic development by increasing the state's average of educational obtainment to meet the national average by 2025 (Deaton, 2011). In addition, Governor Haslem's Drive to 55 Initiative is intended to increase the number of Tennessee residents with postsecondary credentials to 55% by the year 2025. In order to meet the goals of Drive to 55 Governor Haslem has committed to implementing the Tennessee Promise that will provide 2 years of community college education at no cost to Tennessee high school graduates (Haslem, 2014). To support the CCTA the Tennessee Higher Education Commission (THEC) developed a funding formula that provides funding in part based on associate degrees earned at community colleges. By 2018 it is predicted that two thirds of the employment opportunities in the United States will require postsecondary education and the attainment of a degree or certificate (American Association of Community Colleges (AACC), 2012). In addition, to meet the future needs of jobs requiring postsecondary education, President Obama has called for the nation's community colleges to graduate an additional 5 million new graduates by 2020 (The White House, 2015).

Northeast State Community College's (NSCC) Advanced Technologies Division in Blountville, Tennessee, offers Associate of Applied Science (A.A.S.) degree concentrations designed to prepare students to enter the workforce after graduation. The benefits to the graduate in terms of quality of life and potential earnings are also an important consideration. A study conducted by the National Center for Higher Education Management Systems (NCHEMS) revealed that higher educational obtainment typically translates into higher salaries. In 2010

Tennessee graduates 25-64 years of age with an associate degree earned an annual average of $10,975 per year more than those with a high school diploma (NCHEMS, 2014). Sparks (2011) also revealed that graduates with an associate degree in technology can earn wages comparable to graduates with higher degrees depending on job categories.

The purpose of this study is to identify factors that have been associated with persistence to graduation in specific Associate of Applied Science Degree concentrations offered in the Advanced Technologies division at NSCC. It was the intent of this researcher to identify trends in course sequencing that had a positive association with persistence to graduation. This information may be beneficial to faculty and administrators during student advising and course scheduling. This information may also be beneficial to faculty and administrators when designing new degree programs and certificates. The Advanced Technologies A.A.S. degree programs consist of 60 credit hours. Of the 60 credit hours, each concentration consists of 40 credit hours of technical courses (career-focused) and 20 credit hours of general-education courses that include communication, mathematics, physical science, social behavioral science, and humanities courses (Northeast State Community College (NSCC), 2014). The program structure for a typical Advanced Technologies degree program is shown in Table 1. Students who enroll in the Advanced Technology A.A.S. degree program may also be required to enroll in learning support courses that are designed to prepare students academically for success. Learning support requirements for students are determined by a variety of academic assessment measures. It is the significance of sequencing and the blending of all of these courses this researcher has identified.

Table 1

Program Structure Industrial Technology

Requirements	Industrial Technology Concentration: Machine Tool Course Prefix, Number, and Title	Semester Hours
Communications	ENGL 1010 – Composition I	3
	SPCH 2300 – Public Speaking	3
	Communications Total	*6*
Mathematics	MATH 1050 – Trigonometric Applications	4
	Mathematics Total	*4*
Physical Science	PHYS 1030 – Introduction to Physics	4
	Or	
	PSCI 1010 – Physical Science I (Physics and Chemistry)	4
	Physical Science Total	*4*
Technical (Career-Focused)	INTC 1010 – Quality and Inspection	3
	MATT 1110 – Machine Tool Operations I	4
	MATT 1510 – Blueprint Reading for the Machine Trades	4
	INTC 1020 – Safety in the Workplace	3
	MATT 1120 – Machine Tool Operations II	4
	MATT 2210 – Materials and Manufacturing Processes	3
	INTC 1030 – Industrial Concepts	3
	MATT 2130 – Machine Tool Operations III	4
	MFGT 1120 – Computer Numerically Controlled Machines	4
	MATT 2510 – Tool and Die Making	4
	MFGT 2410 – Master Cam I	4
	Technical (Career-Focused) Total	*40*
General Electives	Social/Behavioral Science	3
	Humanities Elective	3
	General Electives Total	*6*
Total 60 Semester Hours	*Degree Total*	*60*

Statement of Purpose

It is desirable that college administrators employ economical methods to identify and implement course sequencing that leads to student completion (Belfield, Crosta, & Jenkins, 2014). There is evidence to support that a career-focused curriculum and a clear path to competition can be associated with higher retention and persistence to graduation (Jenkins & Cho, 2013). Recently, there has been an increased focus on the importance of course sequencing and providing students clear proven pathways to successful completion of a degree or certificate. In order for college administrators to make evidence-based decisions, they must collect and analyze data that measure student success, including successful sequences for competition of learning support and subsequent college-level courses (AACC, 2012). Various researchers have explored the association between college readiness and persistence to graduation; there exists a growing body of research related to advising and pathways (e.g. Alarcon & Edwards, 2013; Bailey et al., 2004; Bailey & Alfonso, 2005; Belfield et al., 2014; Crosta, 2013a; Demetriou & Schmitz-Sciborski, 2011; Jenkins & Cho, 2013; Ran & Cho, 2013).

The available research related to development of institution or program-specific pathways and the sequencing of learning support, career-focused courses, and general-education is limited. This study is an exploration of how the relationship and ratio of learning support courses, general-education courses, and career-focused courses relate to persistence to graduation. Therefore, the purpose of this study is to identify course sequencing associated with students in Advanced Technologies Associate of Applied Science Degree programs who persisted to graduation at Northeast State Community College in Blountville, Tennessee.

Research Questions

The following research questions were addressed in order to determine course sequencing and relationships among course scheduling that may affect student retention and persistence to graduation.

RQ1: Is there a significant difference between first-time full-time freshman completer and noncompleter rates for students requiring one or more learning support courses?

RQ2: Is there a significant difference between first-time full-time freshman completer and noncompleter rates for students based on their completion of learning support reading requirements during the first semester?

RQ3: Is there a significant difference between first-time full-time freshman completer and noncompleter rates for students based on their completion of learning support writing requirements during the first semester?

RQ4: Is there a significant difference between first-time full-time freshman completer and noncompleter rates for students based on their completion of learning support math requirements during the first semester?

RQ5: Is there a significant difference between male and female students related to persistence to graduation?

RQ6: Is there a significant difference between traditional and nontraditional students related to persistence to graduation?

RQ7: Is there a significant difference between students who graduate and students who do not graduate regarding the percent of career-focused courses taken during the first semester?

RQ8: Is there a significant difference between students who graduate and students who do not graduate regarding the percent of career-focused courses taken during the second semester?

RQ9: Is there a significant difference between students who graduate and students who do not graduate regarding the percent of general-education courses taken during the first semester?

RQ10: Is there a significant difference between students who graduate and students who do not graduate regarding the percent of general-education courses taken during the second semester?

Significance of the Study

A growing body of evidence suggests that there will be a shortage of skilled labor necessary to meet the future needs of industry in the US. Findings from a study sponsored by the Manufacturing Institute indicated that the hardest jobs to fill are the jobs that require the most training and have the highest impact on a manufacturer's ability to maintain or expand operations (Morrison et al., 2011). This shortage of skilled labor is significant when coupled with the Complete College Tennessee Act (CCTA) and the new Tennessee Higher Education Commission (THEC) funding formula to provide partial funding based on associate degrees earned at community colleges. It is important that community colleges implement best practices in Career and Technical Education (CTE) to increase student retention and persistence to graduation.

The significance of this study is that the results will add to the body of knowledge that Advanced Technologies faculty and administrators have at their disposal when making programmatic design and course sequencing decisions. Results of this study may also prove

beneficial in creating degree plans as part of the student academic advising process. Ultimately students who otherwise may not have graduated may benefit by completing degrees that can increase their employability and quality of life.

Definition of Terms

It is necessary that fundamental terms be defined to clearly understand this study. The following definitions of terms are provided to offer the reader a basis of context for the terms used in this study.

Advanced Technologies Division – Northeast State Community College's Advanced Technologies Division is defined as:

> The Advanced Technologies Division is to provide academic programs designed for students who desire to enter occupational career fields in business and industry, immediately after graduation. The division provides instruction in Electrical Technology with concentrations in Electrical and Electromechanical; General Technology; Industrial Technology with concentrations in Automotive Service, Engineering Design Technology, Machine Tool, Manufacturing Engineering Technology, Mechanical, Motor Sports, and Welding/Metal Fabrication. (NSCC, 2014)

Advisor, Advisee – The advisor is the individual assigned to help students make determinations concerning their academic program; the student is the advisee (NACADA, 2003).

Associate of Applied Science Degree – An Associate of Applied Science Degree is a 2-year degree that prepares students to enter a career immediately after graduation (Learn.org, 2014).

Career Technical Education (CTE) – Career technical education is education that prepares youth and adults to succeed in fast-growing high-paid jobs in high-growth industries around the country. CTE fields include healthcare, the skilled trades, science, technology, engineering, mathematics, information technology, and marketing (Association for Career & Technical Education (ACTE), 2014).

Career-Focused Course – Career-focused courses are Career Technical Education (CTE) courses that prepare students for employment in a particular field of study.

Community College – "A two-year college where students can learn a skill or prepare to enter a university" (Cambridge Dictionaries Online, 2014).

Completer – A student who completes the requirements for an Associate of Applied Science Degree within 3 years and to whom a degree is conferred.

General Education Course – General education courses are part of an education curriculum shared by all students. They provide broad exposure to multiple disciplines and form the basis for developing essential intellectual, civic, and practical capacities (Association of American Colleges & Universities (AACU), 2014).

Learning Support – "A program of studies in various areas designed to give the student prerequisites to college-level courses which include English/Writing, Mathematics, and Reading" (NSCC, 2014).

Noncompleter – A student who does not complete the requirements for an Associate of Applied Science Degree within 3 years and to whom a degree is not conferred.

Limitations and Delimitations of the Study

This study was limited to a sample of first-time full-time students pursuing an Associate of Applied Science Degree in one of nine Advanced Technologies degree concentrations at a community college in northeast Tennessee. This study was an ex-post-facto design conducted using historical data obtained from the college's information database and the results may not be generalizable to additional populations. Additional limitations and delimitations are as follows:

1. This study was delimited to students enrolled in Advanced Technologies A.A.S. programs at Northeast State Community College and the results may not be appropriate to generalize to other populations.
2. This study was delimited to first-time full-time freshman students.
3. This study does not involve differences in teaching styles by specific instructors.
4. This study does not involve differences in faculty teaching experience.
5. This study does not involve differences between degree concentrations.

Overview of the Study

Chapter 1 serves as an introduction to the study, presents the statement of purpose, and explains the relevance the findings of this study may have on program development and student academic advising at Northeast State Community College. Chapter 1 also introduces the research questions to be addressed, the significance of the study, limitations of the study, and definition of terms. Chapter 2 includes a review of related literature that provides a foundation of information pertinent to the topic of the study. Chapter 3 contains the research design and methodology conducted in the study. Chapter 4 contains the research findings data. Chapter 5 presents a summary of the findings, conclusions, and recommendations for practice and future research.

CHAPTER 2

LITERATURE REVIEW

Introduction

With an increased emphasis on accountability for graduation and retention rates at the community colleges, it is imperative that faculty and administrators research and implement best practices that may be associated with positive results in regard to retention and graduation (AACC, 2012). There is evidence to support the idea that career-focused programs designed to prepare students to enter the workforce not only have higher retention and graduation rates but despite their intent to serve as a terminal degree may also lead to greater transfer rates (Nitecki, 2011).

There are many factors that may attribute to retention and graduation rates in career-focused programs. Some teachers attribute students' noncompletion to a lack of faculty support and the improper selection of courses at the start of a student's education (Dadigamuwa & Senanayake, 2012). A student's preparedness, ability, and motivation have also been identified as reasons for students to drop out of college; of these factors motivation appears to be the most significant factor related to retention. A student with ability may not finish a degree without motivation (Alarcon & Edwards, 2013). Bronfenbrenner (1975) discussed the origins of alienation and the role peer interaction and environment may have on connectedness. With social changes in society there is an increasing tendency for young people to rely on the support of their peers. In a journal article published in 1975 titled Behavior – Alienation the Origins of Alienation, Bronfenbrenner explained how over time young people have shifted from relying on family support toward the support of peers and those outside the family. It has become

increasingly important for educators to understand the relationship of these factors in programs designed to meet the needs of a future workforce.

There are growing concerns that America's colleges and universities are not prepared to fill the shortage of skilled labor required by the nation's manufacturing sector. The national unemployment rate in 2011 was approximately 9%; roughly 600,000 jobs were not being filled (Morrison et al., 2011). Historically during an economic recession the less educated are more likely to experience layoffs and economic hardship. Carnevale, Smith, and Strohl (2013) projected that between 2010 and 2020 the total number of jobs in the US will increase from 140 million to 165 million. The combination of new jobs and retirement will contribute to 55 million vacancies (Carnevale et al., 2013).

A 2015 White House education issues web page explains how postsecondary education is essential to the creation of a strong economy. The author discusses how the growing number of jobs requiring postsecondary education and the average earnings of college graduates are out pacing that of those only attaining a high school diploma. As a result of the increase in jobs requiring postsecondary education, President Obama has made degree attainment for the US a priority (The White House, 2015). The United States has slipped in rank related to 4-year degree attainment over the last 2 decades. In 1990 the US was the international leader in degree attainment among 25- to 34-year-olds, now in 2014 the US is not ranked in the top 10 internationally. The President is committed to increasing educational attainment in the US and has set a goal for the US to be an international leader in degree attainment again by 2020.

In 2010 Tennessee passed the Complete College Tennessee Act (CCTA) aimed at increasing the degree attainment for Tennessee to the national average by 2025 (Deaton, 2011). In Governor Haslam's February 2014 State of the State address he introduced the Tennessee

Promise to increase accesses to the citizens by proposing free tuition at Tennessee community colleges and colleges of applied technology for all high school graduates. The initiatives introduced by Governor Haslam also included additional support for high school and community college dual enrollment opportunities (Haslam, 2014). This initiative will likely increase the number of students attending community colleges, increasing the need for implementation of best practices that lead to higher completion rates.

Research shows that dual enrollment activities often lead to increased completion rates (Risley, 2010). Crosta (2013b) revealed just how diverse trends in enrollment patterns of community college students can be. Crosta presented data indicating that the longer students took to complete their education the more diverse their enrollment patterns. The data for the study came from five community colleges in one state and included 14,429 participants. Although research related to the development of specific program course sequencing and retention appears to be limited, a review of literature uncovered a study related to an accounting program in which course sequencing was considered. Kirk and Spector (2006) conducted a study of the factors affecting student achievement in cost accounting courses. The researchers tested the effects of course sequencing on student performance in subsequent courses. In summary Kirk and Spector reported that in some cases the sequencing of finance courses and accounting courses appeared to affect student performance in a subsequent course. In one instance the findings were somewhat unexpected. Students who did not fulfill a suggested math requirement actually outperformed the students enrolling in an accounting course who did fulfill the suggested prerequisite math course specified in the program curriculum.

Retention

Studies related to retention or why students do not complete their education is nothing new. Tinto was one of the modern pioneers to delve into the topic and draw attention to the complication of factors that may attribute to retention. Tinto's 1975 model incorporated the theories of social integration as a factor in the decision of whether or not students remain in college or drop out. Tinto (1987) not only highlighted the complexity of factors that contribute to retention but placed emphasis on the importance of data-driven decisions. Tinto also acknowledged the uniqueness of institutions and recommended the need for each institution to collect data specific to the institution. Tinto (1997) pointed out the importance of the classroom environment for student involvement and how this association may be linked to retention.

Several organizations and foundations such as the Community College Research Center (CCRC), Lumina, and Completion by Design – an initiative supported by the Bill and Melinda Gates Foundation – have sponsored extensive research and numerous studies focused on the need for intense advising and clear pathways designed to guide students to completion. Jenkins and Cho (2013) suggest program redesign that accelerates entry through completion with clearly defined outcomes leading to end goals, which have the ability to increase student retention and persistence to graduation. Crosta (2013a) conducted an additional study to examine the enrollment patterns of community college students related to successful completion and transfer to a 4-year institution. Crosta suggested that college administrators need to acknowledge a large number of students do not return after the first semester. Crosta then points out the importance of program design and advising strategies to aid retention. In this study Crosta also presented a unique graphical method for displaying enrollment patterns, which visually displays the wide variation of enrollment patterns of successful completers. This study echoes Tinto (2006) in that

the evolution of research has revealed just how complex and interwoven the factors of retention are and that knowing why students do not complete is not the inverse to why students do complete. This research reinforces the need for studies to determine factors that may have a positive effect on retention and persistence to graduation.

Ran and Cho (2013) conducted a study to identify *lingerers* as a group of highly persistent community college students who had not completed a credential and were still enrolled in their 5th year of college. Belfield et al. (2014) investigated the cost associated with the implementation of reforms intended to increase completion related to efficiency. In this study the authors present a model approach to measure the effects of strategies a college might adopt to create efficient pathways. Kopko and Cho (2013) conducted a study of 14,617 first-time students in three different states to determine the timing of when students reached important milestones or exited without completing. Kopko and Cho compared the time of achievement for each milestone for academically prepared students as compared to their counterparts requiring learning support education. During the conclusions section of this study the authors stress that students requiring learning support education overwhelmingly make decisions related to persistence early in their education. The authors further suggest special attention should be given to students requiring learning support education early on during their education to provide support and influence behaviors.

Chaplot, Booth, and Johnstone (2013); Chaplot, Rassen, Jenkins, and Johnstone (2013); and Rassen, Chaplot, Jenkins, and Johnstone (2013a, 2013b) authored a series of four reports intended to serve as guidelines to help community college's increased completion rates. The reports serve as guides to inquiry of best practices. The authors outlined a strategy for colleges to analyze efforts using a framework of student pathways. These strategies included:

1. Define the various pathways that students are taking through the institution.
2. Determine the distribution of students among the most common trajectories, including entry points and end goals.
3. Collect evidence on student performance at multiple points along the college's most common pathways.
4. Determine which approaches will best support students along these common pathways. (Chaplot, Booth, et al., 2013, p. 19)

Rassen et al. (2013b) identified the four phases all students experience that can be used for creating momentum as:

1. In the connection phase, students first engage with the idea of going to college. They are provided or gather on their own the information and resources that lead to the decision to attend college in general, and one college in particular. When looking at the student experience at the institutional level, this phase includes students' selection of a community college to attend. When examining the student experience within a particular program of study, this includes students' exposure to different disciplines and career opportunities.
2. During the entry phase, students arrive at the institution or begin the onramp to a program of study. At the institutional level, this includes admission, financial aid, assessment testing and counseling appointments, as well as the completion of "gatekeeper" courses (such as general education requirements). At the program level, the entry phase begins with students' decision to pursue a particular discipline or program and ends when students have passed the initial required courses or "gatekeepers" for that program.
3. When experiencing the progress phase, students move from their initial engagement with postsecondary education or a particular educational program to a long-term commitment. Specifically, the Loss/Momentum Framework defines progress specifically as completing program requirements, whether that is completion of a credential/degree or a particular program of study. This includes students' enrollment in the courses they need to achieve their educational goal; the learning experience in each of these courses; and the support that is available to move students closer to completion, both inside and outside the classroom.
4. The completion phase comprises both the student's final movement through an institution or program and the attainment of his or her end goals: typically, meaningful employment and/or pursuit of further education. Completion – Complete course of study through earning credential with labor market value. (p. 14)

Chaplot, Rassen, et al. (2013) examined the complexity of completion data and provided suggestions for determining factors affecting completion. They presented eight principles of redesign with promising approaches to transforming student outcomes and student success. A brief summary of the eight principles is provided here.

1. Accelerate entry into clear programs of study: Provide a structured, efficient, and strongly guided student progression experience and offer students a clear sequence of courses that lead to completion.
2. Ensure students know the requirements to succeed. Provide clear information to students about the assessment and placement process as well as the importance of completion; clearly communicate requirements for credentials and the path to achieving them.
3. Minimize time required to get college-ready: Clearly map out program requirements and the program sequence and prescribe a course of study for students based on their goals and level of readiness.
4. Customize and contextualize instruction: Use program-specific content and experiential learning to make programs such as developmental education relevant to students' goals and engaging.
5. Integrate student support with instruction: Embed student support within instruction where appropriate and ensure this support serves students who need it most.
6. Continually monitor student progress and proactively provide feedback: Track and celebrate student progress toward goals, provide prompt and tailored feedback, and use data on student progress to inform planning and the creation of safety nets.
7. Reward behaviors that contribute to completion: Consider both monetary and nonmonetary incentives (such as recognition) to encourage progress and completion.

8. Leverage technology to improve learning and student delivery: Use technology to monitor and recognize student progress and to enhance curriculum.

Bailey and Alfonso (2005) conducted an analysis of research related to the effectiveness of community colleges related to creating paths to persistence. One of the topics the authors discuss is the research involving learning communities related to community colleges. Although the research related to learning communities provides promising results in regards to retention and completion, the majority of research (about 75%) has been focused on 4-year institutions. The authors acknowledged that the most widely recognized study concerning community colleges is Tinto (1997). Bailey and Alfonso (2005) also recommended that faculty and administrators engage in research activities and make decisions based on research. In addition efforts should be made to improve the dissemination of research and increase collaboration between institutions. Bailey and Alfonso shared a common theme with other researchers related to the importance of research at the institution and the importance of data driven decisions. For example, as suggested by Bailey et al. (2004), Bailey and Alfonso (2005), and Tinto (2006), community colleges have begun to conduct meaningful research at their institutions related to retention and completion.

Related community college research has been conducted at Northeast State Community College in Tennessee. Graybeal (2007) examined the attributes of entering fulltime freshman and fall-to-fall retention. Yates (2010) studied graduation rates of first-time freshman related to academic preparedness and required learning support courses. Hamilton (2011) conducted a program specific study of students enrolled in health-related professions and persistence to graduation. The significance of these studies coupled with the vast body of research on retention and persistence to graduation underscore the significance of research in this area. Much of the

current body of research focuses on student preparedness, advising, and creating pathways. Unlike previous research, this study is focused on the sequence of courses and the blending of career-focused courses to general-education courses and required learning support courses. It was the intent of the researcher to identify trends in course sequencing that had a positive association with persistence to graduation in the Advanced Technologies division at Northeast State Community College.

Support Theory

Tinto (1987) suggested social integration may play a significant role in retention. This idea of the importance of social integration proves problematic for commuter schools. Cohorts and course scheduling could possibly provide opportunity for social support and social integration. Lei, Gorelick, Short, Smallwood, and Wright-Porter (2011) discussed the drawbacks and advantages to cohorts. Students enrolled in cohorts may receive the benefits social support and the support of their peers, which is an adaptation of Vygotsky's theory of the zone of proximal development in which a student's individual learning may benefit through collaboration with peers. Davidson, Metzger, and Lindgren (2011) suggest that cohort support and program structure may lead to improved retention. In their study related to nursing students, the authors reported that data collected from a cohort of 56 students with a 100% graduation rate, ranked communication with other students and program format as important to their completion. Potthoff, Batenhorst, Fredrickson, and Tracy (2001) studied the effect of cohort course offerings in a master's degree program and found that the cohort model provided opportunity for high retention rates.

Another example related to peer support is presented by Guillory (2009). Guillory conducted a study of retention strategies for American Indian and Alaska Native college

students. Guillory suggested that students requiring learning support education benefited from support through peer mentoring and relationships with others from similar backgrounds and values. In another related study Bail, Zhang, and Tachiyama (2008) found that low-achieving students enrolled in a self-regulated learning course benefited from taking a course with students they perceived as similar to themselves. Nelson and Johnson (2011) as well as Goto and Martin (2009) reiterate the importance of social support and peer influence related to educational success.

Career Technical Education (CTE) and Retention

Reese (2005); Draeger (2006); Stout and Christenson (2009); Dixon, Cotner, Wilson, and Borman (2011); and Perna (2012) provided compelling evidence that CTE education can be attributed to increased retention in high school students. Loveless (2011) reported a significant difference in the CTE graduation rate for eight school districts in Tennessee as compared to the overall graduation rate. The overarching theme presented by these authors is that students enrolled in CTE education may benefit in regards to retention and completion. The research also seems to indicate that students may benefit from experiential learning and the focus on future occupational goals. The 2011 study by Dixon et al. provided an in-depth look at CTE and student engagement in three career academies from one Florida school district. The study revealed that the strengths of the programs were related to a curriculum that incorporated real-world application and creating a sense of belonging.

Jacobs and Archie (2008) conducted a study to investigate the sense of community in first-year college students. The authors reported that courses incorporating experiential methodologies and philosophies had a positive effect on a student's sense of community. Risley (2010) discussed how dual enrollment opportunities in career-focused courses not only increase

high school graduation rates but increase the completion rate for an associate degree. Numerous other authors highlight the successes of implementing CTE education as a way to increase retention. For example, Gewertz (2011) discussed a successful California high school program that links rigorous core academics with career and technical education. Gewertz explained the importance of practical application of academics through CTE related to student engagement. In a similar example Tews (2011) discusses the benefits of CTE integrated with English and math. The author explains that CTE is vital to student success in Missouri and the nation. Tews stated that research shows incorporating academic skills within a student's area of interest significantly increases student engagement and retention.

Stipanovic (2010) explained how the State of South Carolina enacted the Educational and Economic Development Act (EEDA) in 2005. The EEDA initiative focused on pathways and career exploration in CTE coupled with strong student support and guidance as a mechanism for success. Stipanovic reported that the long-term effects of career counseling resulted in a smoother transition into future life roles and an increase in overall life satisfaction. Robelen (2009) discusses how the state of Louisiana has developed a career-focused diploma to help reduce the state's one third high school population dropout rate. The Louisiana diploma incorporates academic curriculum with CTE focused content relevant to a particular career path. The overall theme of this research indicates that CTE has an intrinsic effect on retention and persistence to graduation.

Need for Career Technical Education

As early as the1800s the Nation's leaders recognized the importance of education that prepared citizens for employment in technical fields. During the 1800s an increase in population and industry created an increased need for skilled workers. Mann, a strong proponent of the

common school, acknowledged the relationship between economic development and education. He indicated that providing a skilled workforce would aid in the expansion of business and industry, which would in turn increase revenue and support for education (Webb, 2006). As a result of the great depression during the 1930s community colleges transformed and began to focus on job training programs in order to improve the lives of the nation's citizens and lower unemployment. The ability of community colleges to respond quickly provides an advantage in their ability to offer programs that meet the needs of the workforce as a result of every changing technology (Kasper, 2003).

This researcher found there is little or no debate to the important role higher education plays in the ability of a society to advance and increase the standard of living for its citizens. Paulsen and Smart (2001) listed lower crime, lower unemployment, and economic development as some of the benefits for investment in education. Current leaders have recently reiterated the importance of education and the need for a skilled workforce. Tennessee Governor Haslem's CCTA and his recent announcement of the Tennessee Promise advocates technical education and a skilled workforce. The Manufacturing Institute issued a 2011 report indicating due to the lack of a skilled workforce, 600,000 jobs went unfilled despite record unemployment (Morrison et al., 2011).

Carnevale et al. (2013) authored a report for the Center on Education and the Workforce at Georgetown University in which they outlined the future job growth and education requirements for the US through 2020. In their report the authors presented data from the America Community Survey (ACS), the Current Population Survey (CPS), and the Bureau of Labor Statistics (BLS). The authors point out that even though the majority of data indicate a significant increase in educational obtainment needed for the jobs of the future, the BLS

projections related to education are flat. The BLS data appear to provide a more conservative outlook when projecting future job growth. Overall, the projections show an increase in employment of 24 million in the next 10 years. When combined with the retirement of 30 million older employees, the total need will be over 54 million jobs, a large percentage of which will require some form of postsecondary education. When considering the overall output of an industry classification, manufacturing is number one and is projected to remain in the top position through 2020 (Carnevale et al., 2013). This review of the literature indicates that there will be a continued need for career technical education and a skilled workforce well into the future.

Chapter Summary

A review of related literature indicates that community colleges will play an important role in meeting the current and future needs of a workforce requiring postsecondary education. A great deal of the research related to postsecondary education and persistence to graduation suggests that a clear concise sequence of required courses through guided pathways can have a positive effect on completion. Although related research indicates career and technical education may have a positive association with competition, research related to the effects career and technical education may have on completion appears to be primarily limited to secondary education. Based on the review of related literature it is apparent that there is a need to continue research related to completion in an attempt to increase the number of students who persist to graduation.

CHAPTER 3

RESEARCH METHODOLOGY

As indicated by research, a clear well defined pathway appears to have a positive effect on student retention and persistence to graduation. Researchers also indicate an increased need for colleges to conduct meaningful research specific to the institution. Through research faculty and administrators can identify a sequence of courses that may lead to increased retention and persistence to graduation, these data can be used to develop program course plans and student pathways. Advisors can use this information when developing individual degree plans for students during initial advising sessions.

This study was conducted using quantitative methods to determine course sequencing and relationships among course scheduling variables that may affect student retention and persistence to graduation for Advanced Technology students at Northeast State Community College. The design of this study was an ex-post-facto design conducted using historical data obtained from the college's information database. The ex-post-facto design allows the researcher to explore possible relationships between variables but does not allow the researcher to introduce new variables because of the historic nature of the data (McMillan & Schumacher, 2006).

Research Questions and Null Hypotheses

Ten research questions and corresponding null hypotheses were addressed and tested in this study.

RQ1: Is there a significant difference between first-time full-time freshman completer and noncompleter rates for students requiring one or more learning support courses?

Ho1: There is no significant difference between first-time full-time freshman completer and noncompleter rates for students requiring one or more learning support courses.

RQ2: Is there a significant difference between first-time full-time freshman completer and noncompleter rates for students based on their completion of learning support reading requirements during the first semester?

Ho2: There is no significant difference between first-time full-time freshman completer and noncompleter rates for students based on their completion of learning support reading requirements during the first semester.

RQ3: Is there a significant difference between first-time full-time freshman completer and noncompleter rates for students based on their completion of learning support writing requirements during the first semester?

Ho3: There is no significant difference between first-time full-time freshman completer and noncompleter rates for students based on their completion of learning support writing requirements during the first semester.

RQ4: Is there a significant difference between first-time full-time freshman completer and noncompleter rates for students based on their completion of learning support math requirements during the first semester?

Ho4: There is no significant difference between first-time full-time freshman completer and noncompleter rates for students based on their completion of learning support math requirements during the first semester.

RQ5: Is there a significant difference between male and female students related to persistence to graduation?

Ho5: There is no significant difference between male and female students related to persistence to graduation.

RQ6: Is there a significant difference between traditional and nontraditional students related to persistence to graduation?

Ho6: There is no significant difference between traditional and nontraditional students related to persistence to graduation.

RQ7: Is there a significant difference between students who graduate and students who do not graduate regarding the percent of career-focused courses taken during the first semester?

Ho7: There is no significant difference between students who graduate and students who do not graduate regarding the percent of career-focused courses taken during the first semester.

RQ8: Is there a significant difference between students who graduate and students who do not graduate regarding the percent of career-focused courses taken during the second semester?

Ho8: There is no significant difference between students who graduate and students who do not graduate regarding the percent of career-focused courses taken during the second semester.

RQ9: Is there a significant difference between students who graduate and students who do not graduate regarding the percent of general-education courses taken during the first semester?

Ho9: There is no significant difference between students who graduate and students who do not graduate regarding the percent of general-education courses taken during the first semester.

RQ10: Is there a significant difference between students who graduate and students who do not graduate regarding the percent of general-education courses taken during the second semester?

Ho10: There is no significant difference between students who graduate and students who do not graduate regarding the percent of general-education courses taken during the second semester.

Population

Participants in this study included first-time full-time students pursuing an Associate of Applied Science Degree in one of the Advanced Technologies degree concentrations at Northeast State Community College (NSCC) in Blountville, Tennessee. The Advanced Technologies division is one of eight academic divisions at NSCC. The Advanced Technologies division offers an Associate of Applied Science Degree in Electrical Technology with two concentrations and an Associate of Applied Science Degree in Industrial Technology with eight concentrations. The fall semester total of students enrolled as declared majors in the 10 concentrations during the study were 429 students (fall 2009), 541 students (fall 2010), and 512 students (fall 2011). The purpose of the Advanced Technologies division is to provide academic programs that prepare students to enter into the workforce immediately upon graduation.

Northeast State Community College started as a regional vocational technical school in 1966 and became a part of the Tennessee Board of Regents in 1983. NSCC later added a university parallel component and became a comprehensive open-access community college under the governance of the Tennessee Board of Regents in 1990 (NSCC, 2014). The Northeast State fall 2013 enrollment headcount was 5,893 credit seeking students. The college student demographics related to age (Figure 1) are 11% under age 18, 52% ages 18-24, 20% ages 25-34,

and 17% over age 35. In regards to gender (Figure 2), the student population is comprised of 53% female and 47% male with 47% of students considered part-time and 53% considered full-time taking 12 or more credit hours per semester (Figure 3) (NSCC, 2014).

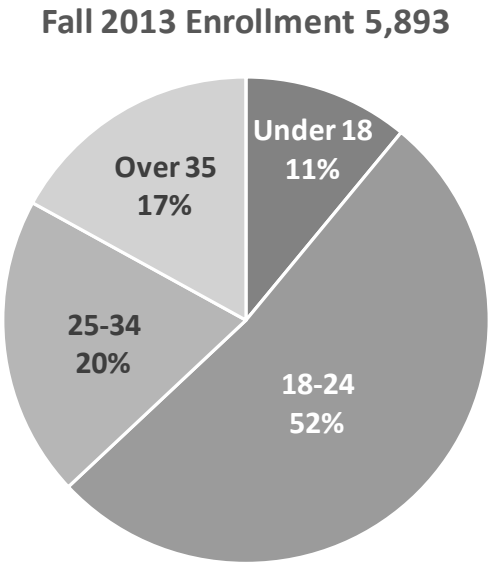

Figure 1. College Demographics Related to Age

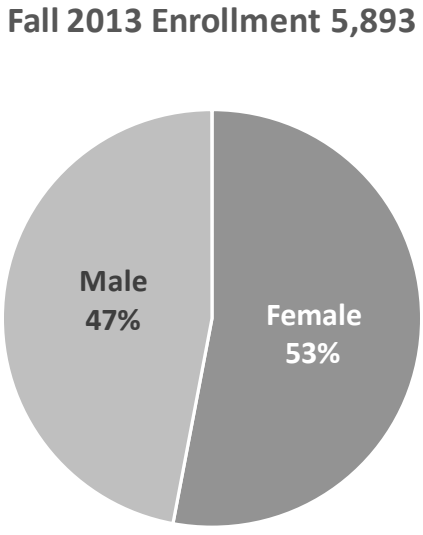

Figure 2. College Demographics Related to Gender

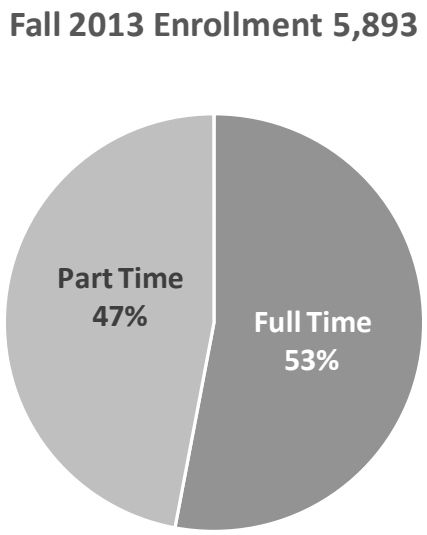

Figure 3. College Demographics Related to Full-Time or Part-Time Status

The population demographics for this study consisted of all first-time full-time students pursuing an Associate of Applied Science Degree in an Advanced Technologies degree concentration who started their program of study during 2009, 2010, and 2011. The demographics are shown in Table 2, Table 3, Table 4, Table 5, Table 6, Table 7, and Table 8.

Table 2

Starting Academic Term

	Frequency	Percent
Fall 2009	89	28.0
Spring 2010	32	10.1
Fall 2010	102	32.1
Spring 2011	24	7.5
Fall 2011	71	22.3
Total	*318*	*100.0*

Table 3

Students Required to Take at Least One Learning Support Course

	Frequency	Percent
Required	271	85.2
Not Required	47	14.8
Total	*318*	*100.0*

Table 4

Gender

	Frequency	Percent
Male	301	94.7
Female	17	5.3
Total	*318*	*100.0*

Table 5

Traditional and Nontraditional Students

	Frequency	Percent
Traditional	255	80.2
Nontraditional	63	19.8
Total	*318*	*100.0*

Table 6

Students Required to Take Learning Support Reading

	Frequency	Percent
Required	122	38.4
Not Required	196	61.6
Total	*318*	*100.0*

Table 7

Students Required to Take Learning Support Writing

	Frequency	Percent
Required	174	54.7
Not Required	144	45.3
Total	*318*	*100.0*

Table 8

Students Required to Take Learning Support Math

	Frequency	Percent
Required	249	78.3
Not Required	69	21.7
Total	*318*	*100.0*

Instrumentation

The data used in this study were obtained from the Northeast State Community College Banner information system, which serves as an integrated database for the college. The Banner system provides access to student information, course information, and administrative records. The NSCC Banner system is part of the statewide database for all TBR institutions. In the fall of 2008 all 19 TBR institutions implemented use of the Banner information system for storage of student records and student information. Data from the Banner system were assembled for all first-time full-time students who began their program of study during the years of 2009, 2010, and 2011 and are pursuing an Associate of Applied Science Degree in one of the Advanced Technologies degree concentrations. The data obtained from the Banner database included student learning support requirements, courses completed by semester, gender, and graduation status. Data were assembled to examine 11 variables used during the statistical analysis:

1. Learning support reading completion during the first semester,
2. Learning support writing completion during the first semester,
3. Learning support math completion during the first semester,
4. Gender,
5. Age,
6. Percent hours of career-focused courses taken during the first semester,
7. Percent hours of career-focused courses taken during the second semester,
8. Percent hours of general-education courses taken during the first semester,
9. Percent hours of general-education courses taken during the second semester,
10. First semester date, and
11. Graduation semester date.

Data Collection

The data used in this study were obtained from the Northeast State Community College Banner information system. After receiving approval from the East Tennessee State University (ETSU) Educational Leadership Dissertation Committee, the research design was submitted to the ETSU Institutional Review Board (IRB) for approval to conduct research. After receiving ETSU IRB approval, the research design was then submitted to the Northeast State Community College division of Research, Analytics, and Planning (RAP) for approval by the President's Council, which serves as the Northeast State Institutional Review Board. The President's Council granted Northeast State IRB approval on October 27, 2014.

On November 1, 2014, the researcher submitted a request for data to the NSCC division of Research, Analytics, and Planning (RAP) via the Institutional Effectiveness Assistance Request System (IEARS). After receiving the request, the Institutional Effectiveness Officer

assigned a data analyst to retrieve the requested data from the NSCC Banner system. On November 17, 2014, the Northeast State data analyst retrieved the requested data from the NSCC Banner system. To capture the necessary data, the analyst developed a custom query to interface with the Banner database. The custom query automatically populated a Microsoft Excel spreadsheet with the assigned data variables.

A preliminary data pull was conducted, and the data were verified by the analyst by comparing the data to official Banner transcripts. In addition, the parameters designated by the data analyst assigned a unique random identifier to each student. All personal student information was removed prior to being transferred to a removable USB storage device that was maintained in a locked cabinet in the Advanced Technologies division office. The data were then transferred to the IBM-SPSS Statistical Package (SPSS) version 16.0 for analysis. All data used in the statistical analyses for this study remained in the Division office and were secured in accordance with FERPA requirements.

Data Analysis

The criterion variable in this study was completion of an Associate of Applied Science Degree in one of nine degree concentrations offered by the Advanced Technologies division. The criterion variable was divided into two groups – completers and noncompleters. Completers are students who completed and graduated with an Associate of Applied Science Degree in 3 years; noncompleters are students who did not finish the required course work and did not graduate within 3 years.

The research questions were analyzed using both descriptive and inferential statistics and analyzed using Chi Square tests of independence (two-way contingency tables). All research questions tested the entire first-time full-time student population pursuing an Associate of

Applied Science Degree in one of the Advanced Technologies degree concentrations who started their program of study during the years of 2009, 2010, and 2011.

Research question 1 tested nominal data retrieved from the student records database related to the completion of those students who were required to take one or more learning support courses. Research question 2 tested nominal data retrieved from the student records database related to the completion of required learning support reading courses during the first semester of attendance. Research question 3 tested nominal data retrieved from the student records database related to the completion of required learning support writing courses during the first semester of attendance. Research question 4 tested nominal data retrieved from the student records database related to the completion of required learning support math courses during the first semester of attendance. Research question 5 tested nominal data retrieved from the student records database related to gender, and research question 6 used nominal data retrieved from the student records database related to traditional or nontraditional student status. Research questions 7 through 10 tested nominal data retrieved from the student records database related to the number course hours taken in ether career-focused or general-education courses during the first two semesters of attendance.

The *hours taken* value in each category was divided by the *total hours attempted during the semester* value. The data were coded as nominal data into five categories, 0%-20%, 21%-40%, 41%-60%, 61%-80%, and 81%-100%. A Chi Square test of independence was used for the analysis of all questions to determine significance. The level of significance for all data analyses was set at an alpha of .05. Table 9 provides the variable name, values, and descriptions used during the statistical analyses.

Table 9

Variables Used for Statistical Analysis

Variable Name	Variable Value	Variable Description
Learning support reading required	0	No
	1	Yes
Learning support writing required	0	No
	1	Yes
Learning support math required	0	No
	1	Yes
Learning support reading taken during first semester of attendance	0	No
	1	Yes
Learning support writing taken during first semester of attendance	0	No
	1	Yes
Learning support math taken during first semester of attendance	0	No
	1	Yes
Gender	0	Female
	1	Male
Traditional or nontraditional student status	0	Nontraditional – 25 and Older
	1	Traditional – Under 25
Percent of career-focused courses taken during the first semester of attendance	1	0%-20%
	2	21%-40%
	3	41%-60%
	4	61%-80%
	5	81%-100%
Percent of career-focused courses taken during the second semester of attendance	1	0%-20%
	2	21%-40%
	3	41%-60%
	4	61%-80%
	5	81%-100%
Percent of general-education courses taken during the first semester of attendance	1	0%-20%
	2	21%-40%
	3	41%-60%
	4	61%-80%
	5	81%-100%

Table 9 (continued)

Variable Name	Variable Value	Variable Description
Percent of general-education courses taken during the second semester of attendance	1	0%-20%
	2	21%-40%
	3	41%-60%
	4	61%-80%
	5	81%-100%
Graduated in 3 years	0	No
	1	Yes

Chapter Summary

Chapter 3 contains the research methodology used to carry out this study. This study was conducted using quantitative methods to analyze historical student information related to course sequencing. The participants in this study were first-time full-time freshman Advanced Technology students whose 3-year program of study at NSCC happened during the years of 2009-2012, 2010-2013, and 2011-2014. Ten research questions were developed to test the associated variables in relation to graduation within 3 years. Chapter 3 also provides a demographic overview of the entire campus population as well as specific demographic information related to the study participants.

CHAPTER 4

FINDINGS

With the 21st-Century Commission on the Future of Community Colleges (AACC, 2012) predicting that by 2018 two thirds of all employment opportunities in the US will require a degree, certificate, or some form of postsecondary education, it is imperative that institutions of higher education implement best practices that may improve retention and persistence to graduation. In addition, the President's initiative to increase the nation's graduates by 5 million by 2020 underscores the important role the nation's community colleges will need to play to make this vision a reality (The White House, 2015). By providing students with a clear sequence of courses and guided pathways that lead to completion, community colleges may be able to increase retention rates and persistence to graduation (Jenkins & Cho, 2013).

Research Questions

In the design of this study, 10 research questions were developed to determine if a significant relationship existed between course sequencing related variables and the persistence to graduation of Advanced Technologies students within 3 years of beginning a course of study.

Research Question 1

RQ1: Is there a significant difference between first-time full-time freshman completer and noncompleter rates for students requiring one or more learning support courses?

Ho1: There is no significant difference between first-time full-time freshman completer and noncompleter rates for students requiring one or more learning support courses.

A chi-square test of independence was conducted to evaluate the null hypothesis that there is no significant difference between first-time full-time freshman completer and noncompleter rates for students requiring one or more learning support courses. The analysis indicated that the completion rate for students requiring one or more learning support course and completers and noncompleters were significantly related, $X^2(1, N = 318) = 7.97, p = .005$. Therefore, the null hypothesis was rejected; there is a significant difference between first-time full-time freshman completer and noncompleter rates for students requiring one or more learning support courses. Students required to take one or more learning support courses experienced a negative effect and were less likely to graduate from the program in 3 years. Table 10 specifies the associated frequencies and percentages related to students requiring one or more learning support courses required and completion within 3 years of beginning a course of study.

Table 10

One or More Learning Support Course Analysis of Completer and Noncompleter

Group	Required		Not Required		Total
	N	%	*N*	%	
Completer	49	18.1	17	36.2	66
Noncompleter	222	81.9	30	63.8	252
Total	*271*	*100*	*47*	*100*	*318*

Research Question 2

RQ2: Is there a significant difference between first-time full-time freshman completer and noncompleter rates for students based on their completion of learning support reading requirements during the first semester?

Ho2: There is no significant difference between first-time full-time freshman completer and noncompleter rates for students based on their completion of learning support reading requirements during the first semester.

Of the 318 Advanced Technologies students in the population, 68 required learning support reading, which represented 21.4% of the total population. Among students requiring learning support reading, 55.7% enrolled in the course and 44.3% did not enroll in the required learning support reading course during the first semester. This percentage shows a nearly even distribution related to enrollment of the students who required learning support reading.

A chi-square test of independence was conducted to evaluate the null hypothesis that there is no significant difference between first-time full-time freshman completer and noncompleter rates for students based on their completion of learning support reading requirements during the first semester. The analysis of the two-way contingency table indicated that the completion rate and student completion of learning support reading requirements were not significantly related, $X^2(1, N = 122) = 0.64$, $p = .424$. Therefore, the null hypothesis was retained; there is no significant difference between first-time full-time freshman completer and noncompleter rates for students based on their completion of learning support reading requirements during the first semester. Table 11 specifies the associated frequencies and percentages related to completion of learning support reading requirements and completion within 3 years of beginning a course of study.

Table 11

Completion of Learning Support Reading Analysis of Completer and Noncompleter

Group	Enrolled		Did Not Enroll		Total
	N	%	*N*	%	
Completer	9	13.2	10	18.5	54
Noncompleter	59	86.8	44	81.5	68
Total	*68*	*100*	*54*	*100*	*122*

Research Question 3

RQ3: Is there a significant difference between first-time full-time freshman completer and noncompleter rates for students based on their completion of learning support writing requirements during the first semester?

Ho3: There is no significant difference between first-time full-time freshman completer and noncompleter rates for students based on their completion of learning support writing requirements during the first semester.

Of the 318 Advanced Technologies students in the population, 174 required learning support writing, which represented 54.7% of the total population. Among students requiring learning support writing, 39.7% enrolled in the course and 60.3% did not enroll in the required learning support writing course during the first semester. This percentage shows that a majority of the students who required learning support writing did not enroll in the course during their first semester.

A chi-square test of independence was conducted to evaluate the null hypothesis that there is no significant difference between first-time full-time freshman completer and noncompleter rates for students based on their completion of learning support writing requirements during the first semester. The analysis of the two-way contingency table indicated that the completion rate and student completion of learning support writing requirements were

not significantly related, $X^2(1, N = 174) = 0.16$, $p = .686$. Therefore, the null hypothesis was retained; there is no significant difference between first-time full-time freshman completer and noncompleter rates for students based on their completion of learning support writing requirements during the first semester. Table 12 specifies the associated frequencies and percentages related to completion of learning support writing requirements and completion within 3 years of beginning a course of study.

Table 12

Completion of Learning Support Writing Analysis of Completer and Noncompleter

Group	Enrolled		Did Not Enroll		Total
	N	%	*N*	%	
Completer	16	15.2	9	13.0	25
Noncompleter	89	84.8	60	87.0	149
Total	*105*	*100*	*69*	*100*	*174*

Research Question 4

RQ4: Is there a significant difference between first-time full-time freshman completer and noncompleter rates for students based on their completion of learning support math requirements during the first semester?

Ho4: There is no significant difference between first-time full-time freshman completer and noncompleter rates for students based on their completion of learning support math requirements during the first semester.

Of the 318 Advanced Technologies students in the population, 249 required learning support math, which represented 78.3% of the total population. Among students requiring learning support math, 81.5% enrolled in the course and 18.5% did not enroll in the required learning support math course during the first semester. This percentage indicates that a majority

of the students who required learning support math enrolled in the course during their first semester.

A chi-square test of independence was conducted to evaluate the null hypothesis that there is no significant difference between first-time full-time freshman completer and noncompleter rates for students based on their completion of learning support math requirements during the first semester. The analysis of the two-way contingency table indicated that the completion rate and student completion of learning support math were not significantly related, $X^2(1, N = 249) = 0.09$, $p = .771$. Therefore, the null hypothesis was retained; there is no significant difference between first-time full-time freshman completer and noncompleter rates for students based on their completion of learning support math requirements during the first semester. Table 13 specifies the associated frequencies and percentages related to completion of learning support math requirements and completion within 3 years of beginning a course of study.

Table 13

Completion of Learning Support Math Analysis of Completer and Noncompleter

Group	Enrolled		Did Not Enroll		Total
	N	%	*N*	%	
Completer	36	17.7	9	19.6	45
Noncompleter	167	82.3	37	80.4	204
Total	*203*	*100*	*46*	*100*	*249*

Research Question 5

RQ5: Is there a significant difference between male and female students related to persistence to graduation?

Ho5: There is no significant difference between male and female students related to persistence to graduation.

The composition of the population in relation to gender was distributed with 94.7% male and 5.3% female. Because the population is disproportionately distributed with only 5.3% females, the following analysis is provided for informational purposes. Given the population distribution and that one chi-square cell contains fewer than five observations, this analysis does not provide evidence that gender matters in relation to graduation. Additional research should be conducted with a larger population to test the relationship between gender and graduation.

A chi-square test of independence was conducted to evaluate the null hypothesis that there is no significant difference between male and female students related to persistence to graduation. The analysis of the two-way contingency table indicated that the completion rate and gender were not significantly related, $X^2(1, N = 318) = 0.88$, $p = .348$. Therefore, the null hypothesis was retained; there is no significant difference between male and female students related to persistence to graduation. Table 14 specifies the associated frequencies and percentages related to gender and completion within 3 years of beginning a course of study.

Table 14

Gender Analysis of Completer and Noncompleter

Group	Females		Males		Total
	N	%	*N*	%	
Completer	2	11.8	64	21.3	66
Noncompleter	15	88.2	237	78.7	252
Total	*17*	*100*	*301*	*100*	*318*

Research Question 6

RQ6: Is there a significant difference between traditional and nontraditional students related to persistence to graduation?

Ho6: There is no significant difference between traditional and nontraditional students related to persistence to graduation.

The composition of the population in relation to traditional and nontraditional students was distributed with 80.2% traditional and 19.8% nontraditional. Traditional students are defined as those being under 25 years of age representing 63% of the college population (Figure 1). Nontraditional students are defined as those being 25 years of age and older representing 37% of the college population (Figure 1).

A chi-square test of independence was conducted to evaluate the null hypothesis that there is no significant difference between traditional and nontraditional students related to persistence to graduation. The analysis of the two-way contingency table indicated that the completion rate and traditional and nontraditional student status were not significantly related, $X^2(1, N = 318) < 0.01$, $p = .979$. Therefore, the null hypothesis was retained; there is no significant difference between traditional and nontraditional students related to persistence to graduation. Table 15 specifies the associated frequencies and percentages related to traditional and nontraditional and completion within 3 years of beginning a course of study.

Table 15

Traditional and Nontraditional Analysis of Completer and Noncompleter

Group	Traditional		Nontraditional		Total
	N	%	*N*	%	
Completer	53	20.8	13	20.6	66
Noncompleter	202	79.2	50	79.4	252
Total	*255*	*100*	*63*	*100*	*318*

Research Question 7

RQ7: Is there a significant difference between students who graduate and students who do not graduate regarding the percent of career-focused courses taken during the first semester?

Ho7: There is no significant difference between students who graduate and students who do not graduate regarding the percent of career-focused courses taken during the first semester.

For this analysis the percent of career-focused courses taken during the first semester was divided into five groups. The composition of the population in relation to the percent of career-focused courses taken during the first semester was distributed with 19.5% in the 0%-20% group, 25.8% in the 21%-40% group, 33.0% in the 41%-60% group, 15.1% in the 61%-80% group, and 6.6% in the 81%-100% group.

A chi-square test of independence was conducted to evaluate the null hypothesis that there is no significant difference between students who graduated and students who did not graduate regarding the percent of career-focused courses taken during the first semester. The analysis indicated that the completion rate and the percent of career-focused courses taken during the first semester and completers and noncompleters were not significantly related, $X^2(4, N = 318) = 2.82$, $p = .588$. Therefore, the null hypothesis was retained; there is no significant difference between students who graduated and students who did not graduate regarding the percent of career-focused courses taken during the first semester.

The analysis indicated that students in the 0%-20% group (19.5%) completed at 17.7%, students in the 21%-40% group (25.8%) had 15.9% completers, students in the 41%-60% group (33.0%) had 24.8% completers, students in the 61%-80% group (15.1%) had 22.9% completers,

and students in the 81%-100% group (6.6%) had 23.8% completers. Table 16 specifies the associated frequencies and percentages related to the percent of career-focused courses taken during the first semester and completion within 3 years of beginning a course of study.

Table 16

Percent of Career-Focused Courses Taken During the First Semester

Group	0%-20%		21%-40%		41%-60%		61%-80%		81%-100%		Total
	N	%	*N*	%	*N*	%	*N*	%	*N*	%	
Completer	11	17.7	13	15.9	26	24.8	11	22.9	5	23.8	66
Noncompleter	51	82.3	69	84.1	79	75.2	37	77.1	16	76.2	252
Total	*62*	*100*	*82*	*100*	*105*	*100*	*48*	*100*	*21*	*100*	*318*

Research Question 8

RQ8: Is there a significant difference between students who graduate and students who do not graduate regarding the percent of career-focused courses taken during the second semester?

Ho8: There is no significant difference between students who graduate and students who do not graduate regarding the percent of career-focused courses taken during the second semester.

For this analysis the percent of career-focused courses taken during the second semester was divided into five groups. The composition of the population in relation to the percent of career-focused courses taken during the second semester was distributed with 30.2% in the 0%-20% group, 9.4% in the 21%-40% group, 21.4% in the 41%-60% group, 21.4% in the 61%-80% group, and 17.6% in the 81%-100% group.

A chi-square test of independence was conducted to evaluate the null hypothesis that there is no significant difference between students who graduated and students who did not

graduate regarding the percent of career-focused courses taken during the second semester. The analysis indicated that the completion rate and the percent of career-focused courses taken during the second semester and completers and noncompleters were significantly related, $X^2(4, N = 318) = 51.4$, $p < .001$. Therefore, the null hypothesis was rejected; there is a significant difference between students who graduated and students who did not graduate regarding the percent of career-focused courses taken during the second semester. The overall graduation rate for the student population in this study was 24.5%. Students who enrolled in 40% or less career-focused courses appeared to have a negative effect on graduation in 3 years. Students who enrolled in 60% or more career-focused courses during the second semester appeared to have a positive effect on graduation in 3 years.

The analysis indicated that students in the 0%-20% group (30.2%) completed at 3.1%, students in the 21%-40% group (9.4%) had 0% completers, students in the 41%-60% group (21.4%) had 25% completers, students in the 61%-80% group (21.4%) had 44.1% completers, and students in the 81%-100% group (17.6%) had 28.6% completers. Table 17 specifies the associated frequencies and percentages related to the percent of career-focused courses taken during the second semester and completion within 3 years of beginning a course of study.

Table 17

Percent of Career-Focused Courses Taken During the Second Semester

Group	0%-20%		21%-40%		41%-60%		61%-80%		81%-100%		Total
	N	%	*N*	%	*N*	%	*N*	%	*N*	%	
Completer	3	3.1	0	0.0	17	25.0	30	44.1	16	28.6	66
Noncompleter	93	96.9	30	100.0	51	75.0	38	55.9	40	71.4	252
Total	*96*	*100*	*30*	*100*	*68*	*100*	*68*	*100*	*56*	*100*	*318*

Research Question 9

RQ9: Is there a significant difference between students who graduate and students who do not graduate regarding the percent of general-education courses taken during the first semester?

Ho9: There is no significant difference between students who graduate and students who do not graduate regarding the percent of general-education courses taken during the first semester.

For this analysis the percent of general-education courses taken during the first semester was divided into five groups. The composition of the population in relation to the percent of general-education courses taken during the first semester was distributed with 65.7% in the 0%-20% group, 23.6% in the 21%-40% group, 8.8% in the 41%-60% group, 1.6% in the 61%-80% group, and 0.3% in the 81%-100% group.

A chi-square test of independence was conducted to evaluate the null hypothesis that there is no significant difference between students who graduated and students who did not graduate regarding the percent of general-education courses taken during the first semester. The analysis indicated that the completion rate and the percent of general-education courses taken during the first semester and completers and noncompleters were not significantly related, $X^2(4, N = 318) = 1.51$, $p = .83$. Therefore, the null hypothesis was retained; there is no significant difference between students who graduated and students who did not graduate regarding the percent of general-education courses taken during the first semester.

The analysis indicated that students in the 0%-20% group (65.7%) completed at 20.6%, students in the 21%-40% group (23.6%) had 18.7% completers, students in the 41%-60% group (8.8%) had 28.6% completers, students in the 61%-80% group (1.6%) had 20.0% completers,

and students in the 81%-100% group (0.3%) had 0.0% completers. Table 18 specifies the associated frequencies and percentages related to the percent of career-focused courses taken during the first semester and completion within 3 years of beginning a course of study.

Table 18

Percent of General-Education Courses Taken During the First Semester

Group	0%-20%		21%-40%		41%-60%		61%-80%		81%-100%		Total
	N	%	*N*	%	*N*	%	*N*	%	*N*	%	
Completer	43	20.6	14	18.7	8	28.6	1	20.0	0	0.0	66
Noncompleter	166	79.4	61	81.3	20	71.4	4	80.0	1	100.0	252
Total	*209*	*100*	*75*	*100*	*28*	*100*	*5*	*100*	*56*	*100*	*318*

Research Question 10

RQ10: Is there a significant difference between students who graduate and students who do not graduate regarding the percent of general-education courses taken during the second semester?

Ho10: There is no significant difference between students who graduate and students who do not graduate regarding the percent of general-education courses taken during the second semester.

For this analysis the percent of general-education courses taken during the second semester was divided into five groups. The composition of the population in relation to the percent of general-education courses taken during the second semester was distributed with 72.3% in the 0%-20% group, 18.6% in the 21%-40% group, 6.9% in the 41%-60% group, 1.6% in the 61%-80% group, and 0.6% in the 81%-100% group.

A chi-square test of independence was conducted to evaluate the null hypothesis that there is no significant difference between students who graduated and students who did not

graduate regarding the percent of general-education courses taken during the second semester. The analysis indicated that the completion rate and the percent of general-education courses taken during the second semester and completers and noncompleters were not significantly related, $X^2(4, N = 318) = 6.0, p = .20$. Therefore, the null hypothesis was retained; there is no significant difference between students who graduated and students who did not graduate regarding the percent of general-education courses taken during the second semester.

The analysis indicated that students in the 0%-20% group (72.3%) completed at 19.6%, students in the 21%-40% group (18.6%) had 30.5% completers, students in the 41%-60% group (6.9%) had 9.1% completers, students in the 61%-80% group (1.6%) had 20.0% completers, and students in the 81%-100% group (0.6%) had 0.0% completers. Table 19 specifies the associated frequencies and percentages related to the percent of career-focused courses taken during the first semester and completion within 3 years of beginning a course of study.

Table 19

Percent of General-Education Courses Taken During the Second Semester

Group	0%-20%		21%-40%		41%-60%		61%-80%		81%-100%		Total
	N	%	*N*	%	*N*	%	*N*	%	*N*	%	
Completer	45	19.6	18	30.5	2	9.1	1	20.0	0	0.0	66
Noncompleter	185	80.4	41	69.5	20	90.9	4	80.0	2	100.0	252
Total	*230*	*100*	*59*	*100*	*22*	*100*	*5*	*100*	*56*	*100*	*318*

Chapter Summary

The findings in chapter 4 indicate that students requiring at least one learning support course and the percent of career-focused courses taken during the second semester were significantly related to graduation in 3 years. Students requiring at least one learning support course experienced a negative effect and were less likely to graduate from the program in 3

years. There was a negative effect on graduation in 3 years for students who enrolled in 40% or less career-focused courses and a positive effect for students who enrolled in 60% or more career-focused courses during the second semester. The completion of learning support requirements during the first semester, percent of career-focused taken during the first semester, gender, traditional or nontraditional student status, percent of general education courses taken during the first semester, and the percent of general education courses taken during the second semester were not significantly related to graduation in 3 years.

CHAPTER 5

SUMMARY OF FINDINGS, CONCLUSIONS, AND RECOMMENDATIONS

A review of the related literature seems to be in agreement in regards to the future need for a skilled workforce with postsecondary education from a community college, which includes a technical degree or credential (AACC, 2012; The White House, 2015). In addition, the literature suggests that the demand for these jobs will increase in the future (Morrison et al., 2011). Carnevale et al. (2013) point out that with the retirement of 30 million employees, the total need will be more than 54 million jobs in the next 10 years. The current and projected need for a skilled workforce with postsecondary education underscores the importance of research that may lead to greater retention and persistence to graduation. Paulsen and Smart (2001) listed additional benefits to the community and society as including lower crime, lower unemployment, and economic development. An analysis of the findings in this study will be useful to guide student advisors and in the development of guided pathways that may have a positive influence on retention and persistence to graduation.

A review of related literature revealed the complexity factors that affect retention and completion. Tinto (1975) studied student retention in an attempt to understand why students persist and why students drop out. Tinto presented a model that incorporated theories of social integration to explain factors that may affect retention. Over the years, Tinto acknowledged just how complex the factors regarding retention are to explain and understand. Tinto (1987) acknowledged the complexity of factors that may have an effect on retention and recommended that educational institutions conduct local research specific to the institution to make decisions in an attempt to improve retention. Tinto (1997) indicated that classroom interaction and student engagement in the classroom may have an association with retention. Then later in his career

Tinto (2006) reiterated the complexity of factors surrounding retention and emphasized the importance of why students persist as compared to why students drop out.

Jenkins and Cho (2013), working in conjunction with the Community College Research Center and the Bill and Melinda Gates Foundation, focused on program design and guided pathways for improving retention and persistence. The authors explained the importance of a program design that provides students a clear path to completion. Crosta (2013a) provided additional research that indicated the importance of understanding student enrollment patterns. By studying the patterns of both successful and unsuccessful students, administrators can make informed decisions regarding program design. Crosta's (2013a) study provided a graphical representation of student enrollment patterns to aid in the understanding of different pathways that students take in an attempt to navigate their college experience.

A study conducted by Ran and Cho (2013) followed students who persisted, despite failing to earn a degree, in an attempt to understand factors that affect retention. A study of 14,617 first-time students conducted by Kopko and Cho (2013) presented the importance of student opportunities to achieve milestones within their educational path. The authors also indicated the importance of support early in the educational experience for students requiring learning support classes.

Summary of Findings

This section is a summary and outline of the analysis findings, as examined relative to each research question. Each of the 10 research questions is explained.

Research Question 1

RQ1: Is there a significant difference between first-time full-time freshman completer and noncompleter rates for students requiring one or more learning support courses?

A review of closely related research indicates that full-time freshman students entering a community college underprepared and requiring learning support courses are less likely to graduate in 3 years (Yates, 2010). Graybeal (2007) confirmed previous research related to the association between the number of remedial and developmental courses, fall-to-fall retention, and persistence to graduation. The composition of the population of Advanced Technology first-time full-time freshman students in relation to students required to take one or more learning support course was distributed with 85.2% requiring one or more learning support and 14.8% requiring no learning support courses.

Analysis of the two-way contingency table indicated that the completion rate for students requiring one or more learning support courses and completers and noncompleters were significantly related. The analysis suggests that there is a significant difference between first-time full-time freshman completer and noncompleter rates for students requiring one or more learning support courses; students requiring at least one learning support course experienced a negative effect and were less likely to graduate from the program in 3 years. The findings of the analysis related to graduation support the findings by Yates (2010). One difference to point out is that the population in the study conducted by Yates included a college-wide first-time full-time freshman student population of students who graduated from high school between 2003 and 2006 and enrolled during the following fall semester, as compared to this study that involved career-focused Associate of Applied Science Degree seeking students. Students in the Yates's

study who required learning support courses represented 67.8% of the population and graduated at 16.1%, whereas, students in this study who required at least one learning support course represented 85.2% of the population and graduated at 18.1%.

Research Question 2

RQ2: Is there a significant difference between first-time full-time freshman completer and noncompleter rates for students based on their completion of learning support reading requirements during the first semester?

Rassen et al. (2013a) pointed out the importance of program design with a clear sequence of courses that lead to completion. With 85.2% of Advanced Technologies students in this study population requiring at least one learning support it is apparent that a clear sequence of courses, including learning support for Advanced Technology students, is essential. It is the intent of this research design to determine course sequencing, including learning support, which has a positive association on completion. Of students requiring learning support reading, 55.7% enrolled in the course and 44.3% did not enroll in the required learning support reading course during the first semester.

Analysis of the two-way contingency table indicated that the completion rate and student completion of learning support reading requirements were not significantly related. The analysis suggests that there is no significant difference between first-time full-time freshman completer and noncompleter rates for students based on their completion of learning support reading requirements during the first semester. This information is important and will be very useful in the design of future programs and the implementation of learning support reading courses. The results of this analysis appear to be counter to rational thought regarding students requiring learning support courses. However, these results are similar to the results in the Kirk and Spector

(2006) study related to student success when bypassing a required prerequisite designed to prepare students for a subsequent course.

Research Question 3

RQ3: Is there a significant difference between first-time full-time freshman completer and noncompleter rates for students based on their completion of learning support writing requirements during the first semester?

The population of students requiring learning support writing included 39.7% enrolled in a required learning support writing course and 60.3% not enrolled in the required learning support writing course during their first semester.

Analysis of the two-way contingency table indicated that the completion rate and student completion of learning support writing requirements were not significantly related. Similar to research question 2, the finding that there is no significant difference between first-time full-time freshman completer and noncompleter rates for students based on their completion of learning support writing requirements during the first semester is pertinent. With the creation of new programs to meet employer needs and an increasing emphasis on the importance of pathways and student advising (Jenkins & Cho, 2013), this information will be useful to faculty during program development and advising.

Research Question 4

RQ4: Is there a significant difference between first-time full-time freshman completer and noncompleter rates for students based on their completion of learning support math requirements during the first semester?

A large percentage of students requiring learning support math enrolled in a learning support course during their first semester of attendance. Many of the career-focused courses

include a substantial amount of math throughout the course. The large percentage of students who enrolled in learning support math during the first semester may be a result of a perception that in order to be successful in a technical course a student would need to first be proficient in math. Of students requiring learning support math, 81.5% enrolled in the course and 18.5% did not enroll in the required learning support math course during their first semester.

Analysis of the two-way contingency table indicated that the completion rate and student completion of learning support math requirements were not significantly related. Similar to learning support reading and writing requirement completion, the analysis suggested that there is no significant difference between first-time full-time freshman completer and noncompleter rates for students based on their completion of learning support math requirements during the first semester. The results mirror the results in the study by Kirk and Spector (2006) related to students success when bypassing a required prerequisite designed to prepare students for a subsequent course. Kirk and Spector's study showed that accounting students who bypassed the required math prerequisite actually out performed students in the subsequent course. Although not statically significant, of the 249 students required to take learning support math, 17.7% of students who completed enrolled during their first semester, and 19.6% of the completers did not enroll in the first semester.

The analysis also indicated there is no significant difference between first-time full-time freshman completer and noncompleter rates for students based on their completion of learning support math requirements during the first semester. This result supports the ideas presented by Tews (2011) related to integrating math into CTE courses. Math intensive career-focused courses often include embedded assignments aimed at providing math skills required within the course.

The finding will be relevant to those determining course sequencing of learning support courses for existing and new programs, as well as when conducting student advising.

Research Question 5

RQ5: Is there a significant difference between male and female students related to persistence to graduation?

The composition of the population of Advanced Technology first-time full-time freshman students in relation to gender was distributed with 94.7% male and 5.3% female. Because the population is disproportionately distributed with only 5.3% female the following analysis is provided for informational purposes. Given the population distribution and that one chi-square cell contains less than five observations, this analysis does not provide evidence that gender matters in relation to graduation. Additional research should be conducted with a larger population to test the relationship between gender and graduation.

Analysis of the two-way contingency table indicated that the completion rate and gender were not significantly related. Future research may find that there is no significant difference between male and female students related to persistence to graduation, which could be important information for faculty, college administrators, and advisors. As highlighted by Morrison et al. (2011) in their Manufacturing Institute report, 600,000 jobs went unfilled despite record unemployment. Carnevale et al. (2013) projected that by 2020 the total number of jobs in the US will increase from 140 million to 165 million and a growing number of these jobs will require postsecondary education. This information may provide advisors with insight for recruitment of females in traditionally male dominated fields. Based on the low percentage number of female students enrolled in the Advanced Technologies division programs, the findings of the analysis do not appear to support some aspects of research related to peer support. Guillory (2009) and

Bail et al. (2008) found that students benefited through peer support by enrolling in courses with students who shared a similar background and students they perceived as like them.

Research Question 6

RQ6: Is there a significant difference between traditional and nontraditional students related to persistence to graduation?

The composition of the population in relation to traditional and nontraditional students was distributed with 80.2% traditional and 19.8% nontraditional.

Analysis of the two-way contingency table indicated that the completion rate and traditional and nontraditional student status were not significantly related. The finding that there is no significant difference between traditional and nontraditional students related to persistence to graduation is of value to faculty, college administrators, and advisors. With President Obama's call for the nation's community colleges to graduate an additional 5 million new graduates by 2020 (The White House, 2015), and the 21st-Century Commission on the Future of Community Colleges predicting two thirds of the employment opportunities in the United States will require postsecondary education and the attainment of a degree or certificate, this finding will provide valuable information for faculty, college administrators, and advisors in the recruitment of new students.

Research Question 7

RQ7: Is there a significant difference between students who graduate and students who do not graduate regarding the percent of career-focused courses taken during the first semester?

For this analysis the percent of career-focused courses taken during the first semester was divided into five groups. The composition of the population in relation to the percent of career-

focused courses taken during the first semester was distributed with 19.5% in the 0%-20% group, 25.8% in the 21%-40% group, 33.0% in the 41%-60% group, 15.1% in the 61%-80% group, and 6.6% in the 81%-100% group.

Analysis of the two-way contingency table indicated that the completion rate and the percent of career-focused courses taken during the first semester for completers and noncompleters were not significantly related. A review of related literature revealed that career-focused courses may be positively associated with retention and persistence. There is a substantial body of literature related to CTE and retention in high school level programs. Dixon et al. (2011); Draeger (2006); Perna (2012); Reese (2005); and Stout and Christenson (2009) present evidence that CTE may have a positive association with retention and persistence to graduation. Loveless (2011) studied high school CTE students in eight school districts located in the same geographic area as the program in this study. The results from Loveless indicated that CTE programs were positively associated with higher retention and persistence.

Although the average completion rate for the Advanced Technologies division is 24.5% and the college wide completion rate is 17.0%, the analysis of research question 7: Is there a significant difference between students who graduate and students who do not graduate regarding the percent of career-focused courses taken during the first semester, does not appear to be supported by the body of research. This divergence may indicate that it is not appropriate to generalize the results of high school level programs to college level courses.

Research Question 8

RQ8: Is there a significant difference between students who graduate and students who do not graduate regarding the percent of career-focused courses taken during the second semester?

For this analysis the percent of career-focused courses taken during the second semester was divided into five groups. The composition of the population in relation to the percent of career-focused courses taken during the second semester was distributed with 30.2% in the 0%-20% group, 9.4% in the 21%-40% group, 21.4% in the 41%-60% group, 21.4% in the 61%-80% group, and 17.6% in the 81%-100% group.

Analysis of the two-way contingency table indicated that the completion rate and the percent of career-focused courses taken during the second semester for completers and noncompleters were significantly related. The analysis indicated that students in the 0%-20% group (19.5%) completed at 17.7%, students in the 21%-40% group (25.8%) had 15.9% completers, students in the 41%-60% group (33.0%) had 24.8% completers, students in the 61%-80% group (15.1%) had 22.9% completers, and students in the 81%-100% group (6.6%) had 23.8% completers.

Findings of the analysis provide some very interesting data that appear to be supported by previous research. With an overall 3-year average graduation rate in the Advanced Technologies program during the time of this study at 24.5% and the campus-wide community college average for 2013 at 17.0%, it appears that career-focused technical programs may be retaining or students in these programs may be persisting at a higher level.

The most intriguing result of the analysis was the completion rate for Advanced Technologies students who enrolled in the 61%-80% career-focused group. Of the total population, 21.4% of students enrolled in 61%-81% career-focused courses. This group graduated within 3 years at an impressive rate of 44.1%. This finding is supported by the work completed by Rassen et al. (2013a) in the identification of the four phases that all students experience to use for creating momentum. During phase 3 – the progress phase – students gain

momentum by completing specific program requirements that include courses required to obtain their educational or career goals. In addition, Chaplot, Rassen, et al. (2013) offered eight principles for program design that improve student success. Of the eight, the importance of program specific and experiential learning and development of education relevant to the student's end goals are listed as promising approchases. It is inclusive as to why there is a significant difference between completers and noncompleters regarding the percent of career-focused courses taken during the second semester rather than the first semester, which is an area for future research that will be discussed during the recommendations section of this study.

Research Question 9

RQ9: Is there a significant difference between students who graduate and students who do not graduate regarding the percent of general-education courses taken during the first semester?

For this analysis the percent of general-education courses taken during the first semester was divided into five groups. The composition of the population in relation to the percent of general-education courses taken during the first semester was distributed with 65.7% in the 0%-20% group, 23.6% in the 21%-40% group, 8.8% in the 41%-60% group, 1.6% in the 61%-80% group, and 0.3% in the 81%-100% group.

Analysis of the two-way contingency table indicated that the completion rate and the percent of general-education courses taken during the first semester and completers and noncompleters were not significantly related. Findings of the analysis that there is no significant difference between completers and noncompleters regarding the percent of general-education courses taken during the first semester is of value to faculty, college administrators, and advisors.

This finding can help guide program design and advising related to general-education course sequencing.

Research Question 10

RQ10: Is there a significant difference between students who graduate and students who do not graduate regarding the percent of general-education courses taken during the second semester?

For this analysis the percent of general-education courses taken during the second semester was divided into five groups. The composition of the population in relation to the percent of general-education courses taken during the second semester was distributed with 72.3% in the 0%-20% group, 18.6% in the 21%-40% group, 6.9% in the 41%-60% group, 1.6% in the 61%-80% group, and 0.6% in the 81%-100% group.

Analysis of the two-way contingency table indicated that the completion rate and the percent of general-education courses taken during the second semester and completers and noncompleters were not significantly related. Similar to question 8, the findings of this analysis that there is no significant difference between students who graduated and students who did not graduate regarding the percent of general-education courses taken during the second semester is of value to faculty, college administrators, and advisors. These findings are not significantly inverse to question 7 (Is there a significant difference between students who graduate and students who do not graduate regarding the percent of career-focused courses taken during the first semester). A recommendation for future research that will be discussed during the conclusions section of this study will suggest investigation of this finding.

Although some analyses were not significant at the .05 alpha level, it should be noted that the differences in percentage of students graduating could provide insight relevant to course

sequencing that may have an effect on graduation rates. Acknowledging disparity in percentages between students who graduated in 3 years and students who did not graduate in 3 years could provide an opportunity to increase the number of students who persist to graduation.

Conclusions

Based on the findings from the analysis of data, the researcher offers the following four conclusions:

1. Students requiring at least one learning support course graduate at a rate that is significantly lower than students who do not require a learning support course.
2. Among students requiring a learning support course, there is no significant difference in graduation rates between students who satisfy their learning support course requirement during the first semester and those who do not satisfy the learning support course requirement during their first semester. This finding provides valuable insight related to learning support requirements for those designing programs and creating guided pathways.
3. The courses taken during the first semester do not appear to have an association with student retention and persistence to graduation within 3 years. This has implications for those designing new programs and advisors when consulting with students.
4. Course choices made during a student's second semester appear to have an association with student retention and persistence to graduation within 3 years. Based on the findings, it may be beneficial for students to enroll in more than 40% of career-focused course hours. Students who enrolled in 60% to 80% of

career-focused course hours graduated at more than twice the average of the study population and more than 2.5 times the college average.

Recommendations for Practice

With an increasing demand for a skilled workforce and changes in funding for community colleges linked to higher retention and graduation rates, it is imperative that college administrators research and implement best practices related to retention. The findings in this study may serve as a guide for advisors related to the sequencing of courses that may have a positive association with student retention and persistence to graduation. In addition, faculty and administrators developing new programs may glean insight that will be useful in determining the sequencing of required learning support courses in relation to other course requirements. Based on the findings in this study the researcher recommends that the college engage in the following practices.

1. Review current programs and advising strategies to take into account the importance of second semester career-focused courses. This would include second semester career-focused course offerings to accommodate students who enroll in learning support and general-education courses during their first semester.
2. Continue to work with area high schools to create programs and curricula that will increase the academic preparedness of students entering the Advanced Technologies degrees.
3. Create degree plans that include pathways for students requiring learning support courses.
4. Create degree plans and pathways that ensure students will enroll in a significant percentage of career-focused courses during their second semester.

5. Continue to conduct research related to retention, monitor persistence to graduation, and implement best practices.

Recommendations for Future Research

As with previous research, this study has revealed that the factors affecting student retention and persistence to graduation are multifaceted and that research findings are sometimes unexpected. This study was limited to a sample of first-time full-time students pursuing an Associate of Applied Science Degree in the Advanced Technologies degree concentration at a community college in northeast Tennessee. In addition, the analysis of course sequencing and percentage of course types enrolled focused on variables that occurred during the first and second semester. As a result of this study, eight recommendations for future research are provided here:

1. Conduct research to determine the effect of course sequencing on retention and graduation beyond 3 years.
2. Conduct additional research to determine graduation and retention of students who satisfy their learning support requirements after the first semester.
3. Conduct research to determine the possible effects related to the percentage of career-focused and general-education courses taken during semesters beyond the second semester.
4. Conduct additional research to determine how the variables in this study affect part-time students.
5. Conduct research that takes into consideration student success in first semester learning support courses.
6. Conduct qualitative research that considers student perceptions and career goals.

7. Conduct research related to factors outside the classroom that may influence student retention and persistence to graduation. An important consideration would be collecting data on the number of students who become employed as a result of their course work and do not graduate.
8. Expand the research to include similar programs at other colleges both regionally and nationally.

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